



Quantifying Phosphorus Loss in Runoff from Grazing Cattle



WISCONSIN GRAZING LANDS CONSERVATION INITIATIVE GRANT PROGRAM

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Research Brief

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Non-point source pollution of surface waters by phosphorus (P) can reduce water quality for drinking, recreation, and industry and affect the health of aquatic systems through eutrophication. Because significant P is lost from agricultural systems via surface runoff, there is a need to develop methods to quickly and accurately quantify runoff P loss from farms, identify the major sources of farm P loss, and implement management practices to reduce P loss.

Simulation models are often used to estimate P loss because quantifying runoff P loss from multiple sources on a dairy farm through physical monitoring is expensive and time-consuming. This project sought to provide validation of these models. The objectives of this project were to: i) monitor P loss in runoff from eight beef and dairy grazed pastures at the UW Platteville Pioneer Farm, ii) use the runoff data to validate the ability of the Annual P Loss Estimator (APLE) model to predict P loss in runoff from grazed pasture, and iii) use APLE to simulate annual P loss from four Wisconsin grazing farms and determine relative impact of pastures to whole-farm P loss. One major purpose of the study is to help improve the SNAP+ nutrient management software for use with cattle pastures in Wisconsin.

Eight hydrologically-isolated basins were established ranging in size from 0.7 to 1.0 acre in an existing cattle pasture at the UW-Platteville Pioneer Farm. The eight runoff basins were within existing pastures grazed by beef and non-lactating dairy cattle. Runoff collection shelters were installed at the outlet of each basin. The flow was measured and runoff samples were collected.

Management data was gathered from four grazing dairy farms to allow assessment of whole-farm P loss using both the APLE model and SNAP+ software. Two farms were located in north-central Wisconsin near Athens and Edgar, and the other two farms were located in southwestern Wisconsin near Richland Center and Blanchardville.

The project has established a data set for P loss in runoff from dairy and beef grazed pastures for WI conditions. It has also increased the research capacity for future evaluation of grazing practices on nutrient loss in runoff. Results from the project demonstrate that the APLE model can be used to reliably estimate P loss in runoff from all areas on a dairy farm.

In general, runoff monitoring and modeling results show that, at the whole-farm level, average P loss (lb/acre) from these types of farms is generally low, especially from grazed pastures. This reflects the generally low rates of erosion from grazing farms where a significant portion of land is in permanently vegetated pastures or hay, or has hay in rotation with low soil exposure. However, there are areas on grazing farms that can represent sources of significant P loss. As expected, cropland on grazing farms had the greatest P loss was from areas with exposed soil, typically for corn production, and especially on steeper sloping land. Other areas of the farm where significant P loss is possible include animal housing, barnyards, and over-wintering and young stock lots. These areas can generate 10 to almost 60 percent of total farm P loss, depending on lot management and P loss from other land uses.

The Grazing Lands Conservation Initiative Grant Program is a partnership between the private sector GLCI Steering Committee, the USDA Natural Resources Conservation Service and the WI Department of Agriculture, Trade, and Consumer Protection. This series of research briefs summarizes projects funded by this program. Our mission is to expand the use of profitable, grazing-based livestock production systems that foster environmental stewardship. This is accomplished through high quality technical assistance to owners and operators of private land, university and producer coordinated research, and educational programs. For more information on the program or on the research in this Brief, contact: Laura Paine, Grazing and Organic Agriculture Specialist, WI Department of Agriculture, Trade, and Consumer Protection, (608) 224-5120, laura.paine@wi.gov; or Rhonda Gildersleeve, Extension Grazing Specialist, University of Wisconsin-Extension, (608) 723-6243, rhonda.gildersleeve@ces.uwex.edu. This summary was written by Ken Barnett with University of Wisconsin-Extension.